

SysBank: A Knowledge Base for Systematic Reviews of Randomized Clinical Trials

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Abstract

The Systematic Review Bank (SysBank) is a structured knowledge base that captures information about the design, execution, and results of systematic reviews of randomized controlled trials (RCTs). The SysBank data model has been adapted from RCT Bank, a knowledge base of randomized trials, and refined using three published systematic reviews. SysBank links directly to the RCT Bank entries of studies included in the systematic review. SysBank builds upon RCT Bank to support computer-assisted evidence-based medicine.

Background

A systematic review involves finding, appraising and synthesizing evidence from clinical studies to obtain an overview on a specific topic. Systematic reviewing is considered the canonical method for interpreting a set of related RCTs for clinical application, and RCTs are the “gold standard” for judging the safety and efficacy of new treatments.

When appropriate, quantitative outcomes from the reviewed studies can be statistically combined to produce more precise estimates of treatment effect. Such meta-analyses require detailed qualitative and quantitative information about the individual studies.

The findings of summary reviews (and the findings of the RCTs on which they are based) are currently published only as text articles that are of limited machine understandability. We developed SysBank to capture information about the design, execution, and results of summary reviews into a structured electronic knowledge base. Our goal is to facilitate accessibility and interpretation of clinical research findings, to promote the application of these findings to clinical practice.

Methods

We designed the SysBank ontology as a frame-based model using the Generic Knowledge Base (GKB) Editor (1). The SysBank knowledge base is implemented in the Ocelot frame-based system (2).

We adapted the SysBank ontology from that of the Trial Bank system (3), which captures information about the design, execution, and summary results of RCTs into a structured electronic knowledge base called RCT Bank. The RCT Bank data model is based on a task analysis of systematic reviewing. Clinical trials and systematic reviews share many elements, such as investigators, inclusion criteria, and study outcomes. However, the subjects analyzed are

people in RCTs and trials in systematic reviews. SysBank has pointers to the RCT Bank entry of all trials included in a SysBank systematic review.

The SysBank ontology also incorporates data elements suggested by reporting recommendations for systematic reviews (4). We have refined the SysBank model using three systematic reviews, two of them published in JAMA and one in BMJ.

Results

The SysBank ontology is a seven-level hierarchy comprising 138 classes and 531 slots. Completely capturing one systematic review (5) required the creation of 318 instances. This systematic review of 20 RCTs included five *a priori* and one *post-hoc* meta-analyses. Each meta-analysis included both random and fixed-effect models, and assessment of heterogeneity. The study eligibility criteria differed based on outcome, and the flowchart of study selection was reported for each meta-analysis. Four of the studies were included in two meta-analyses. In one case, different arms of one trial were included in different meta-analyses. The SysBank model was able to accommodate all these attributes.

Conclusions

SysBank captures information on systematic reviews into a structured electronic knowledge base. By linking to the RCT Bank entries of clinical trials included in the systematic reviews, SysBank builds upon the Trial Bank project to create an information infrastructure for supporting computer-assisted evidence-based medicine.

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